Urban Runoff in Dry Run, Scioto Watershed, Ohio

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Introduction

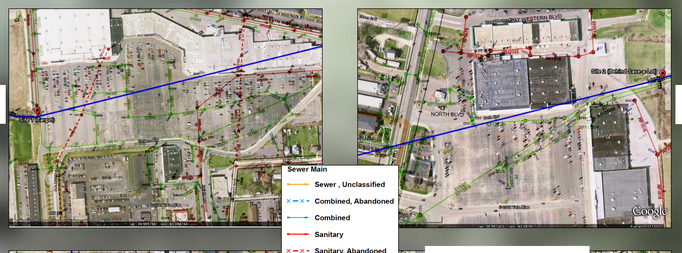
More than 75% of the U.S. population lives in urban areas. Over 130,000 km of streams and rivers are impaired by urbanization. As a result of urbanization there are more impervious surfaces which lead to a decrease in infiltration and an increase in surface runoff (Paul). This can lead to higher peak discharges and reduction of groundwater recharge resulting in a reduction of baseflow discharge. As well as geomorphic changes, storm water runoff from hot impervious surfaces can lead to short increases in stream temperature. In terms of chemistry, there is generally a decrease in pH, an increase in oxygen demand, suspended solids, ammonium, hydrocarbons, and metals, in urban streams (Paul). Dry Run (5.7 mi^2), located in the Upper Scioto River watershed, is a small stream that flows through the west side of the city of Columbus. Dry Run passes through various settings. It flows under railroads, major roads, and highways (I-70 and I-270). It flows through residential neighborhoods and parks as well as areas of business and is used for storm water management. In a 1995 report by the Ohio EPA, it was suggested that Dry Run retain its designation as a Warmwater Habitat for aquatic life (Altfater).

Objectives

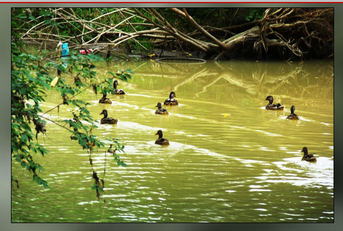
- To quantify temperature changes in a small urban stream during storm events
- To measure changes in water properties during storm events, specifically pH and specific conductance
- To measure changes in water chemistry: major ions, nutrients, total organic carbon (TOC), and potentially trace metals
- To examine the relationship between air temperatures and stream temperatures and to study temperature controls on streams

The Sites

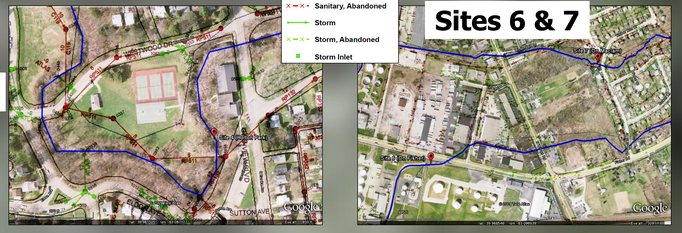
Site 1



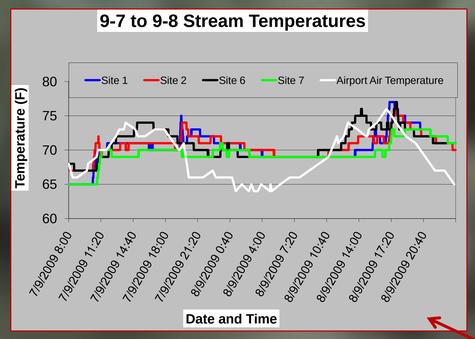
Site 2

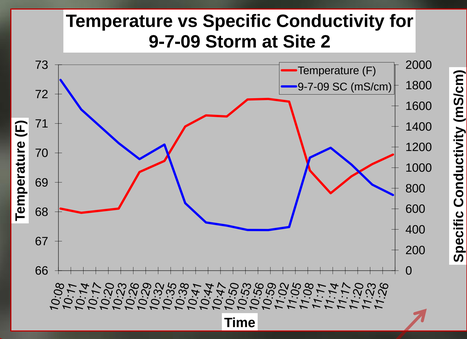


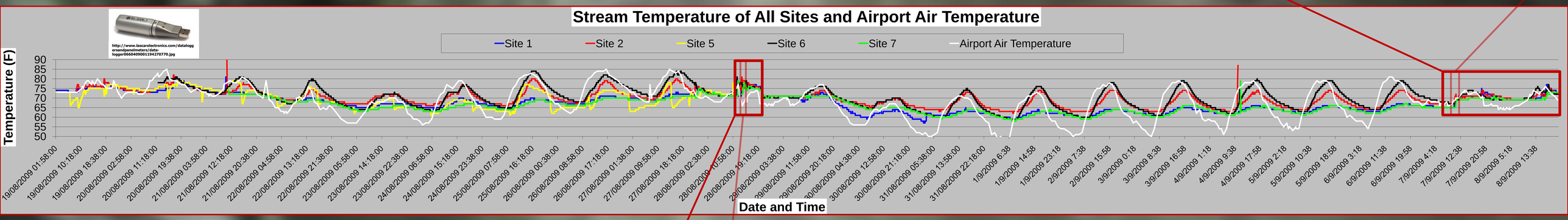
Site 4



Sites 6 & 7

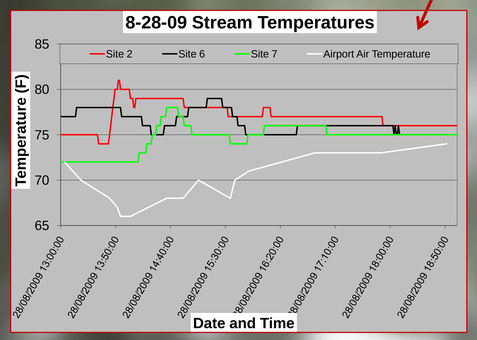


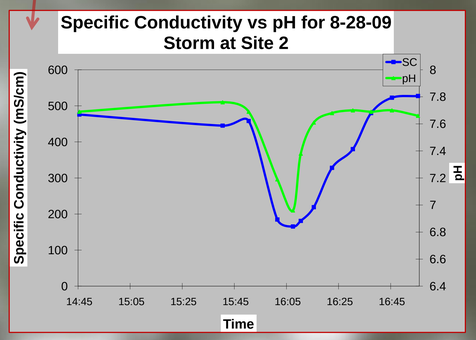




Methods

Dry Run was thoroughly explored between I-70 and I-270. Five LASCAR temperature loggers were placed at different locations in the stream, starting August 17th. The LASCARs recorded temperatures of the stream every minute. The data were downloaded approximately once a week and examined. Air temperature data from the Columbus Airport and a LASCAR placed at Site 2 were also collected. During major rain events a YSI handheld water meter was taken to a site to measure temperature, pH, and specific conductivity. During future storms, the baseflow and storm discharge will be measured in ten minute intervals. Also during these intervals the pH and specific conductivity will be measured and the stream will be sampled for major ions, nutrients, and TOC.





Results

- Significant stream temperature increases for short durations during and after the storm events
- For some storm events, stream temperatures exceeded air temperatures which dropped as the storm moved in
- 8-28-09 storm (~2in. rain) showed a significant drop in pH and specific conductance at Site 2
- 9-7-09 storm (~0.1in rain) showed a significant drop in specific conductance but not pH
- These two storms produce obvious stream temperature spikes (<10ºF) which were recorded by the LASCARs

Future Work

Temperature loggers will remain in stream sites for a few more weeks. Data will continue to be collected. Discharge before, during, and after a storm event will be measured. During the same storm, water samples will be taken and run for major ions, nutrients, and TOC. Trace metal analysis is a possibility, but depends on lab availability and required clean level. Once these data are analyzed the same process could be applied to a larger stream or even a river, examining urban runoff on a somewhat larger scale.

References

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